

Journal clubs in the digital age: Twitter for continuing professional development

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ABSTRACT

The departmental journal club (JC) is a well-established form of continuing professional development (CPD). Social media offers a range of interactive online platforms, allowing the traditional JC to move from a formal educational meeting with local health professionals to a digital platform with users across the world. The authors created the General Internal Medicine JC (@GIMJClub) on Twitter and following a year of activity retrospectively analysed the participation and impact of this medium of JC delivery. There were 61 different participants across different continents, specialties and levels who participated in the 12 JC sessions and sent 1,543 tweets in total. Factors that appeared to influence the success of an individual JC session included choosing diverse, topical papers to discuss and a wide range of hosts. This work demonstrates the success of a Twitter-based general internal medicine JC for CPD. @GIMJClub facilitated unique and diverse interactions not otherwise available.

KEYWORDS: Twitter, journal club, medical education, social media

Introduction

Journal clubs have long been the mainstay of medical and academic teaching. That is, a group gather and discuss the merits and pitfalls of a recent research publication of interest. Within a department's journal club (JC) there would be a weekly or monthly meeting and a cross section of experience, roles and seniority. These forums offer the opportunity to both teach literature critical appraisal and keep physicians up to date with cutting edge evidence-based medicine.¹

Social media comprises a range of online platforms allowing real-time interactions between users for an immediate exchange

of information. Social media is a widely-utilised technology and as such may provide a novel supplemental learning modality. Social media as a learning tool has been a consequence of further developments in e-learning. E-learning modules traditionally provided a didactic approach to tutorials with or without a self-assessment component. Web 2.0 software enables discussion and interaction between individuals.

It has been more than a decade since the advent of social media. Twitter is a micro blogging site and is one of the most commonly used forms for this medium with over 230 million users.² Twitter allows users to have a small biography (bio) about themselves, seek out key word descriptors, 'follow' updates from others and converse in real time. The conversation takes the form of short public posts called tweets with a maximum of 140 characters, which can include pictures, videos, hashtags or hyperlinks. Naturally, this has evolved beyond simply a social forum and now involves professional interactions and discussion with the rapid dissemination of knowledge and opinions. Table 1 defines commonly used terms relating to Twitter.³ Specialty-specific Twitter journal clubs have become well established:^{4,5} urology (@iurojc, #urojc), cardiology (@Heart_BMJ, #HeartJC) and plastic surgery (@prsjournal, #PRSJjournalclub) to name a few.

The aim of this work was to assess the success and engagement of a general internal medicine twitter journal club and assess what factors contribute to success of a regular social media-based learning event.

@GIMJClub conception

The authors of this piece established the general internal medicine twitter journal club (@GIMJClub) on 1 December 2015. The authors' intention was to create a journal club across the breadth of general internal medicine to allow healthcare professionals from different backgrounds to discuss critical questions beyond their own specialty. The format is that on a pre-determined monthly date, a clinician in a particular field chairs a specific JC, focusing on one paper. The paper is chosen by the host and is agreed with the journal club moderators. The host is rotated each month. Topics were chosen to represent a range of challenges and concepts encountered in a variety of general medical settings. The JC ran on a designated Sunday every month either at 20:00 or 21:00 (GMT/BST) for approximately 1 hour. The chair would advertise the session through the @GIMJClub account, and frequently via their own

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Table 1. Definitions of commonly encountered twitter terminology

Twitter term	Definition
Tweet	Contains up to 140 characters and can include a photograph, video, link or hashtag
@	This sign identifies a username; also known as an '@ handle'
Hashtag	A word or phrase (with no spaces or punctuation between words) which is immediately preceded by the # symbol. Clicking on it generates a list of tweets in which that hashtag features
Retweet (RT)	A carbon copy sharing of a tweet to all of your followers by clicking the retweet button. Unedited RTs always retain credit of the original user
Like	By clicking on the 'heart' icon it shows that you agree with the sentiment of a tweet or appreciate it
Follow	Users can choose which accounts to follow; this dictates the tweets that will appear in their timeline. Accounts are followed by clicking the icon on a user's profile page or next to the @ handle in their tweets.
Impression	When a tweet 'lands'/or is seen on an individual's timeline. This can be counted by Twitter metrics, informing us of how many users' timelines has had this tweet appear
Engagement	An interaction with a Tweet. Clicks anywhere on the Tweet, including RTs, replies, follows, likes, links, cards, hashtags, embedded media, username, profile photo or Tweet expansion are considered an engagement
Detail expands	Clicks on the Tweet to view more details
Link clicks	Clicks on a URL or card in the Tweet
Media engagements	Number of times the media is clicked on to open in the tweet, ie the video, GIF or picture is bigger and clearer on the screen
Profile clicks	Number of clicks on your name, your @ handle or your profile picture linking to your profile page

Taken and adapted from the official Twitter online glossary.³

account, prior to the session. The session would use the hashtag #genmedjc and four or five questions would be devised by the chair to be released during the hour to initiate discussions and debates around the chosen topic.

Methods

A retrospective observational study of the @GIMJClub activity and engagement over 12 months (December 2015–December 2016) was undertaken. Metrics for engagement (Table 1) and activity were assessed using the Twitter search function and analytic data. Only tweets using the #genmedjc on the day of the session were analysed. Tweets were identified by using the Twitter search function with the hashtag and the date range in question, eg '#genmedjc since: 2015-12-01 until:2015-12-31'. The search was undertaken during March and April 2017. Participants' demographics were collected manually by reviewing their biographies and the followers of the account during March 2017 were located using Tweepmap online software (Canada).⁶ The tweets analysed had to include the hashtag #genmedjc to be included in the analysis because of the limitations of the Twitter search engine. Frequently, a minority of participants would start and continue an interaction without the hashtag. Furthermore, participants, on occasion, misspelt the hashtag title (eg #gimjc and #genmedjp). This meant that not all participants and tweets could be included in the analysis and unfortunately is a limitation of this work. Consent was obtained from the participants whose tweets we have published.

Results

In March 2017, the JC account had a total of 880 followers. Fig 1 shows a map representation of the location of all the followers: 62.9% were situated in the UK and 14.7% in the USA. Twelve sessions were run by different chairs over the year of observation

(one per month). The article selected for discussion was at the discretion of the chair and often reflected their area of interest or expertise. Table 2 summarises the articles discussed^{7–18} and the informatics about the chairs' Twitter accounts. Sessions are labelled 1–12 based on sequential order of sessions.

After the inaugural session, the most popular month for attracting new participants was the 10th month (Fig 2) when a renal specialty trainee hosted the session, looking at early warning alert systems for acute kidney injury (AKI). This attracted predominantly renal specialists as new participants. Worth noting is that month 10 also attracted the biggest diversity in nationalities.

Online it may be challenging to assess how engaged in a discussion participants are. Twitter's 140-character limit leads to users sending multiple tweets and as such can be used to assess how intense a conversation is with the number of exchanges recorded. A total of 1,543 tweets were sent across the sessions using the unique hashtag, averaging 128 tweets per session. Fig 3 shows overall number of hashtag uses during each session and a breakdown of this by host or participant. As may be noted in a conventional teaching session in a room of people, the teacher/host may need to prompt or encourage participants to encourage discussion. During month 1 and month 9, the hashtag was used the most. More pertinent is the difference seen in month 2 and month 5 between tweets sent by participants and hosts (Fig 3). In month 2, there were ardent debates between participants on appropriate blood pressure targets when the host provided very little prompting to stimulate discussion. Whereas in month 5, the host comparatively had a lot to say about the appropriate use of statins in older patients, as did participants. Using month 2 as an example, there were 148 exchanges with only 29 coming from the host. This would correspond to a lively and interactive conventional teaching session.

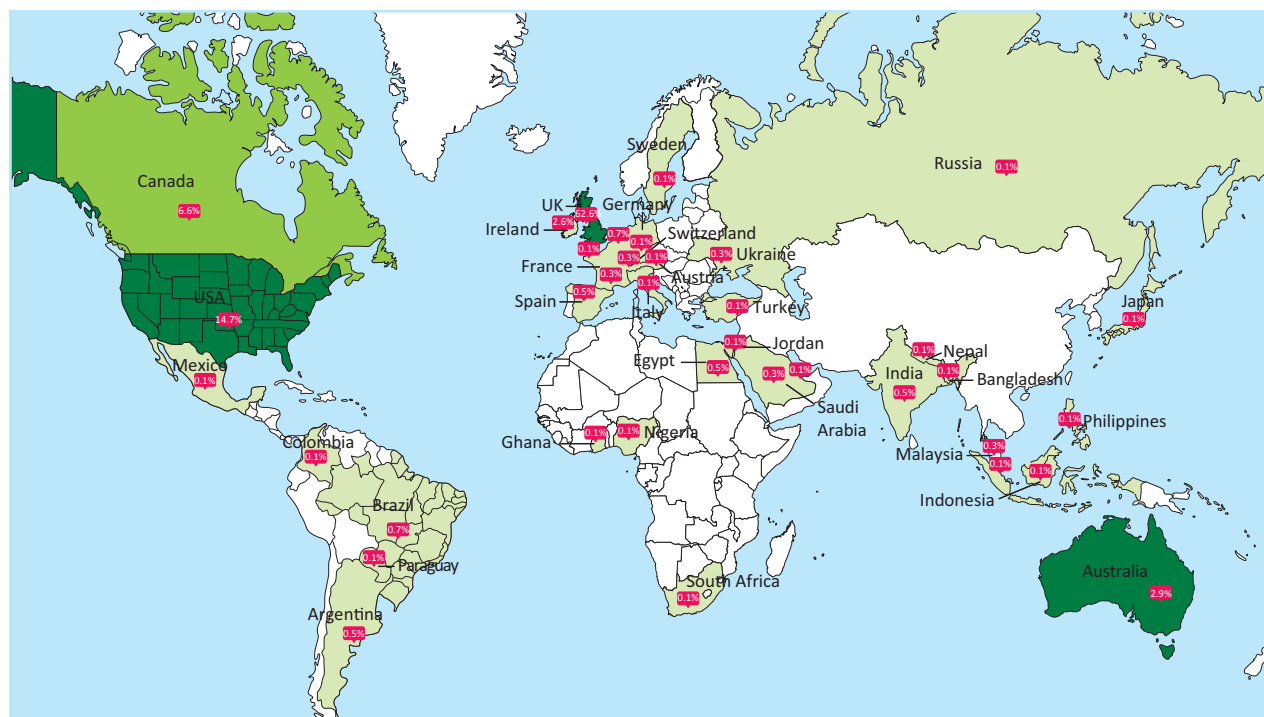


Fig 1. Map of @GIMJClub account followers. The numbers correspond to the percentage of total followers from the underlying country.

Table 2. Characteristics of the paper presented and those of the journal club host

Topic	IF of journal	Seniority level of host	Host's speciality	Host's number of Twitter followers [§]	Host's number of tweets [§]	Host joined Twitter
1 Diuretic Strategies for acute heart failure ⁷	59 [§] (72 ⁺)	ST	Cardiology	1,036	4,880	May-11
2 SPRINT blood pressure trial ⁸	59 [§] (72 ⁺)	ST	Cardiology	1,539	30,700	Feb-10
3 CTCA for evaluation of chest pain ⁹	59 [§] (72 ⁺)	ST	Cardiology	3,009	48,700	Nov-12
4 Diagnostic criteria for sepsis ¹⁰	37 [§] (44 ⁺)	ST*	AIM	403	2,210	Nov-14
5 PROSPER statin trial in elderly ¹¹	44 ^{§+}	Consultant	COTE	1,453	20,700	May-15
6 Alteplase dose for acute stroke ¹²	59 [§] (72 ⁺)	Academic ST	COTE & stroke	1,503	11,400	Apr-08
7 PREDIMED diet trial ¹³	59 [§] (72 ⁺)	ST	Cardiology	5,536	6,286	Mar-14
8 ICU admission in patients over 80 ¹⁴	10 [§] (12 ⁺)	ICM fellow	Anaesthetics & ICM	2,181	46,900	Aug-10
9 Pulmonary hypertension referral pathways ¹⁵	14 [§] (16.5 ⁺)	Consultant^	PAH	2,833	5,523	Mar-11
10 Acute kidney injury warning system ¹⁶	44 [§] (47.8 ⁺)	ST*	Renal	2,248	18,000	May-13
11 SANAD trial of anti-epileptics ¹⁷	44 [§] (47.8 ⁺)	ST	Neurology	108	2,707	Aug-11
12 Glucose control in critically ill patients ¹⁸	59 [§] (72 ⁺)	Consultant	Endocrinology & diabetes	10,600	69,700	Dec-09

*Specialty trainee on date of session; however, they have now progressed to consultant level. ^American equivalent of UK consultant level (attending physician).

[§]These figures are from time of analysis, March 2017 and not the date of the journal club session. ⁺updated impact factors from summer 2017.

AIM = acute internal medicine; COTE = care of the elderly; CTCA = computerised tomography coronary angiogram; ICM = intensive care medicine; ICU = intensive care unit; IF = impact factor; PAH = pulmonary arterial hypertension; ST = specialty trainee.

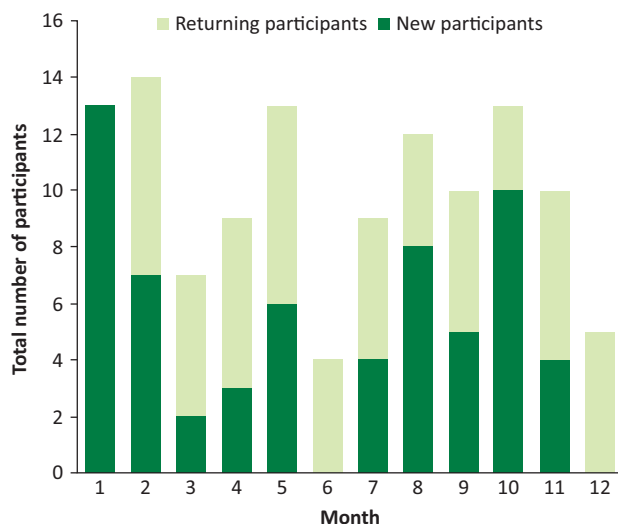


Fig 2. Monthly journal club participants. The total number of active participants contributing to each journal club session is broken down by returning (light) and new (dark) participants. Session 1 is used as the index.

Each tweet sent from a Twitter account has a metric analysis available to the account holder (definitions in Table 1). This allows for assessment of the impact a particular tweet has had – such as how often it has been retweeted and replied to. The average impressions and engagements of the tweets in each session was obtained and plotted (with standard deviation) for each month (Fig 4). Month 11 had the most impressions, ie the #genmedjc appeared on the most twitter accounts’ timelines, and month 3 had the least. Interestingly, this is not a direct correlation with the number of participants or the total number of hashtag uses.

Every host mentioned chairing JC at least once in their own twitter account; therefore, analysis of their overall Twitter activity was undertaken. This included their own personal total number of followers, the number of tweets they have posted and how long they have been on twitter (Table 2). These latter factors were taken as representation of how established

a reputation they had and how experienced they were at using the Twitter interface. As would be expected, the number of followers a host had, largely related to how many tweets were sent from their personal account. As such, a greater number of followers suggests a bigger Twitter presence and larger sphere of influence, potentially increasing the number of participants in an organised event such as a JC.

Comments from JC hosts

The authors sought comment from the JC hosts regarding their experience. With consent, their opinions are below.

It was a challenge to run a JC for people I didn’t know... but it was fulfilling to explore a topic with others, and get some different insights.

As an ICU physician, it was wonderful sharing a paper and discussing it with general physician colleagues. I really enjoyed the discussion generated and it’s certainly changed my practice.

Wholly educational interactions with doctors from outside your specialty are surprisingly rare so this was a great opportunity to teach and learn from a diverse group of doctors.

It required lots of attention to keep up with everyone’s comments but was also more rewarding than expected. Comments from others helped me to see different views from the same data.

It was a fantastic experience... as it not only gave opportunity to discuss diabetes care with many other professionals but also an opportunity for me to discuss others’ views too. In a short concise format, it appeared to work well.

Each host mentions a positive experience from the JC and an overall feeling of fulfilment. Further to this, the benefit of obtaining diverse opinions was a common theme (Box 1).

Discussion

Twitter is a micro-blogging website which has a 140-character limit to each post, meaning interactions are normally concise. Twitter accounts can be private or public, personal

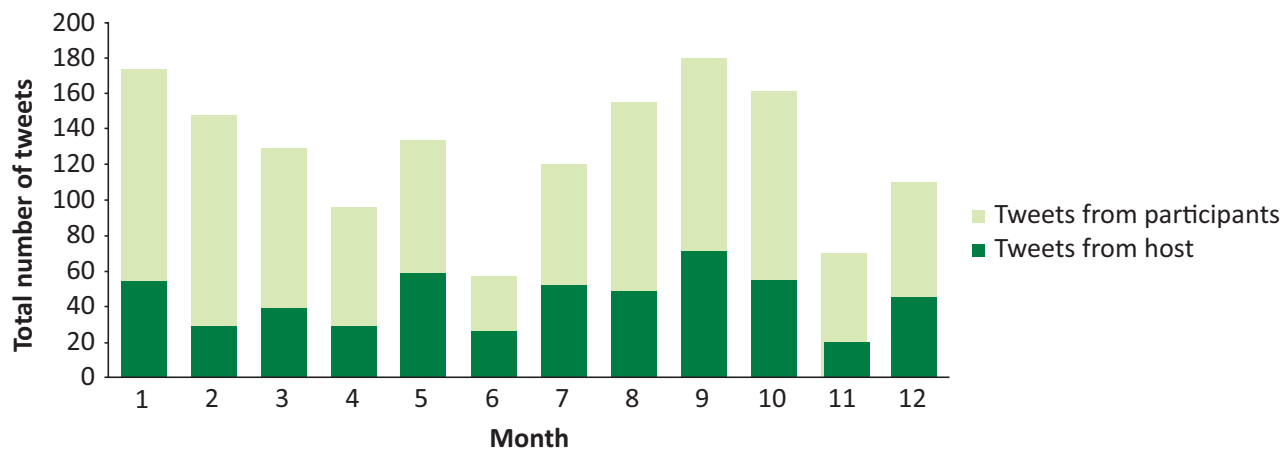


Fig 3. Frequency of hashtag use during the journal club session. The use of #genmedjc reflects the intensity of the conversation during each monthly session. Each month is numbered 1–12 and the total number of tweets for each session is broken down by tweets by the JC host (dark green) and by other participants in the session (light green).

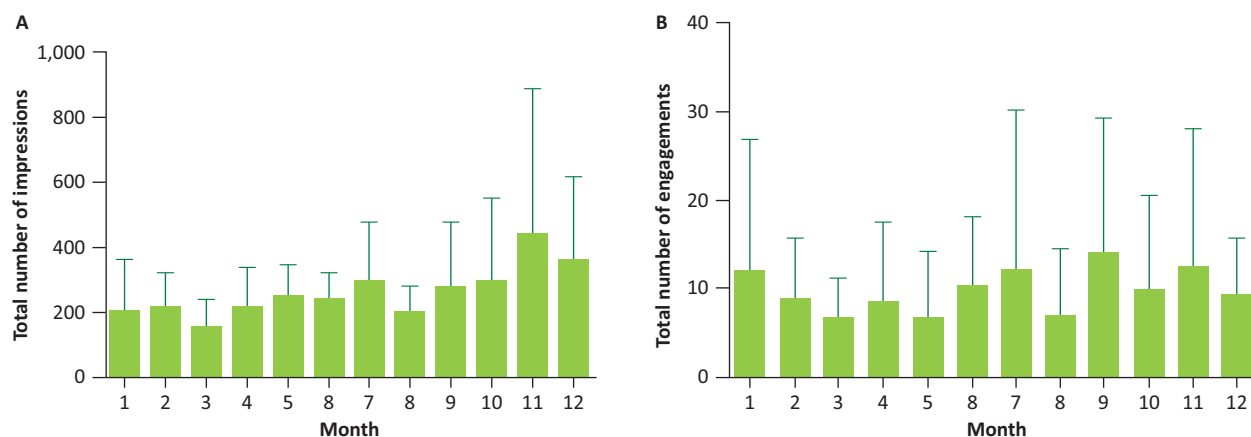


Fig 4. Journal club metrics displayed by month. Each month is numbered 1–12 as per Table 2. A – the mean number of impressions per tweet each month, displayed with standard deviation; B – the mean number of engagements per tweet in a month with standard deviation.

or professional. Twitter can be used for medical education in various ways: for publishing factual soundbites, links to recently published work, as a study resource, a supportive platform between students and teachers or student peers, or simply for developing one’s professional network.¹⁹ Social media is a tool that facilitates the formation of associations and relationships, and enables discussion and collaboration to happen and a viable method of delivering interactive medical education. Real-time interactions enable social media platforms to host interactive conversations and as such facilitate professional discussion and collaboration. With the ability to download transcripts, Twitter JCs could provide a method of accredited CPD, especially for those who can’t take part during the time of the JC.

Many of our participants were based in the UK and there are various reasons why that may be. It could be the Sunday evening GMT/BST time slot was desirable. It could be because the discussions were in English or occasionally studies discussed related particularly well to working in the NHS. This created some open discussions on resource availability and

costs in differing regions or countries. This was particularly pertinent in the session discussing the use of computerised tomography coronary angiography to evaluate chest pain presentations (month 3). This session generated discussion of service implications and costs within the emergency and radiology departments if such a study were to be implemented nationwide. This suggests the Twitter JC format allows for different domains of medical education to be covered, such as clinical governance and resource allocation, in addition to explicit knowledge exchange.

In addition to this, month 9 was hosted by our only non-UK based host. It is clear from Fig 1 that diverse nationalities follow the account. Of the five new participants, this session (Fig 2), four were of non-UK nationality and this trend continued into month 10. It is difficult to know why more followers did not formally participate in sessions. One can surmise that others participated passively in the JC by following discussions without contributing themselves (colloquially known online as ‘lurking’), perhaps because of language barriers, the British time zone, a lack of confidence, inability to commit time or a simple preference to observe anonymously. However, participants did comment that they felt less intimidated by asking questions than they would in a traditional JC setting, demonstrating the power of social media to democratise information and remove barriers, perceived or real. Similarly, participants and hosts alike commented on the usefulness of the Twitter-based JC to enable the consideration of other opinions and obtain information from specialists (see examples of tweets in Fig 5).

The ‘Net Generation’ theory suggests that those born after the mid-1980s are more likely to use social media.^{20,21} As such, it would be a logical hypothesis to think that most participants would be a junior doctor if using level of seniority as a surrogate for age. 41% of our session participants could be identified as being of training grade (data not shown), suggesting a large proportion of the participants were more senior. This number suggests that senior doctors are embracing social media for medical education. With this comes benefits such as easily accessed CPD relevant to participating clinicians and also improved confidence and communication skills for the juniors who are taking part. Furthermore, it is likely that the numbers using social media will increase as the ‘Net Generation’ progress

Box 1. Benefits of a Twitter journal club

- > Peer education
- > Dissemination of knowledge
- > Diverse participants
- > Specialists on hand
- > Informal and abolishes hierarchy
- > Fun
- > Confidence building
- > Can participate while multi-tasking with family life, other work
- > Empowering patient and lay members to take part
- > Can take part on the move, anywhere in the world
- > Provides insight into organisational and cultural differences
- > Access to transcripts following the club
- > Don't feel pressured to take part
- > Self-selected group, therefore, motivated participants



Fig 5. Examples of tweets during sessions of @GIMJClub. A – a tweet from an acute internal medicine consultant appreciating information on diuretic therapies for acute heart failure; B – a tweet from a GP participant enjoying the different perspectives provided by the Twitter journal club.

through seniority levels. According to the most recent data, over 90% of medical students, 80% of doctors in training, over 60% of GPs and 40% of specialists use some form of social media.^{22–24}

The predominance of nephrologists could be due to there being a well-established and successful renal specialty JC (@nephJC).²⁵ The papers discussed by @nephJC include modern chronic kidney disease classification²⁶ and AKI in pregnancy.²⁷ The hosts have a website with further reading material relating to the area discussed and compared with @GIMJClub, there are a larger group of coordinators who run it. Furthermore, it was established in April 2014 and currently has around 5,000 followers (compared with 880 of @GIMJClub in March 2017). The success of @nephjc is summarised by Topf *et al*²⁵ and there are some overlapping topics between both JCs, with both groups discussing one paper – the SPRINT trial.⁸ The @GIMJClub SPRINT discussion was one of the busiest, or most successful, weeks as suggested by the number of participants (Fig 2), by the number of times the #genmedjc hashtag was used by participants and by how little host prompting was required (Fig 3). It was also one of the busiest discussions at #nephjc. SPRINT is a study that overlaps between multiple general internal medicine subspecialties and has been an extensively discussed trial in the last 18 months. These factors will have undoubtedly contributed to both JCs having such successful sessions when SPRINT was the chosen topic. Interestingly, in addition to the presence of nephrologists, the only two surgical colleagues who participated were urologists and, again, there is established urology social media use.^{28–30}

The first Twitter medical JC was established in 2011, called @twitjournalclub (#twitjc) but has since stopped.³¹ There are also several other medical twitter JCs available, such as @gpjournalclub (#gpjc) discussing primary care articles once a month since 2015 with over 900 followers, Sheffield Teaching Hospitals Anaesthetics and Critical Care Department has its own twitter account, @STHJournalClub, discussing anaesthetic and critical care issues (although it does not appear this account has ever actually hosted a scheduled JC), the journals *Circulation: Cardiovascular Quality and Outcomes* (#OutcomesJC) and *BMJ Heart* (#HeartJC) both have twitter journal clubs. Another includes @hpmjc (#hpm) for hospice and palliative medicine with over 1,300 followers. Although there is no published evidence on which to base this, the authors observe that there is greater representation of some specialties

compared with others. It would be intriguing to investigate this from a social, educational and industry point of view.

A possible downside of a Twitter JC could be that it is currently not recognised formally for CPD. Further to this, many of those who don't use Twitter see it as frivolous and time wasting therefore attracting participants outside of work hours is a potential challenge. This is supported by current data that suggest only 24% of clinicians use social media to actively seek new medical information and even fewer (12%) contribute new information to social media. Furthermore, doctors appear to use social media predominantly for interactions with family and friends (83%), for entertainment (60%) and only 15% for CPD; however, data specifically for Twitter are not known.^{32,33} The authors feel that the number of participants and level of interaction in @GIMJClub disproves this. Possible issues unique to the Twitter JC format include choosing a time that maximises access across the world, language barriers and difficulty in following conversations unless familiar with the software. The name itself is perhaps suboptimal, as many medical specialty curricula in the UK no longer include general internal medicine. Additionally, the term may not be well known outside the UK, for example in America and Europe it would be termed purely 'internal medicine'. Further to this, given that some specialties are disproportionately represented on Twitter, finding hosts from a range of general internal medicine specialties and keeping the topics interesting and varied may present challenges for future sessions.

In conclusion, we feel our analysis demonstrates the success of a Twitter-based general internal medicine JC as a means of CPD. @GIMJClub attracted many grades and specialties of clinician and facilitated diverse interactions that would be impossible with conventional teaching formats. Social media-based medical education offers an accessible and unique method to increase learning, but currently is not formally accredited. ■

Conflicts of interest

The authors have no conflicts of interest to disclose.

Author contributions

EM undertook the data analysis and initial preparation of the manuscript. RF assisted in figure preparation and preparation of the manuscript. DRW contributed to manuscript preparation. CJM devised the concept of the JC, hosted a session of the JC and

contributed to manuscript preparation. Each author hosted a month of the Twitter JC.

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Twitter

The authors tweet under the following monikers:

- > Dr Eilidh McGinnigle = @EilidhPinkChic
- > Dr David Warriner = @DrDavidWarriner
- > Dr Rohin Francis = @MedCrisis
- > Dr Christopher McAloon = @DrChrisMcAloon

References

- 1 Ebbert JO, Montori VM, Schultz HJ. The journal club in postgraduate medical education: a systematic review. *Med Teach* 2001;23:455–61.
- 2 Duggan M, Ellison NB, Lampe C, Lenhart A, Madden M. *Social Media Update 2014*. Washington DC: Pew Research Center, 2015. www.pewinternet.org/2015/01/09/social-media-update-2014/ [Accessed 24 August 2017].
- 3 Twitter. The Twitter glossary. <https://support.twitter.com/articles/166337> [Accessed 27 July 2017].
- 4 Leung EY, Tirlapur SA, Siassakos D, Khan KS. #BlueJC: BJOG and Katherine Twining Network collaborate to facilitate post-publication peer review and enhance research literacy via a Twitter journal club. *BJOG* 2013;120:657–60.
- 5 Thangasamy IA, Leveridge M, Davies BJ *et al*. International Urology Journal Club via Twitter: 12-month experience. *Eur Urol* 2014;66:112–17.
- 6 Tweepemap. <https://tweepemap.com/> [Accessed March 2017].
- 7 Felker GM, Lee KL, Bull DA *et al*. Diuretic strategies in patients with acute decompensated heart failure. *N Engl J Med* 2011;364:797–805.
- 8 Group SR, Wright JT Jr, Williamson JD *et al*. A randomized trial of intensive versus standard blood-pressure control. *N Engl J Med* 2015;373:2103–16.
- 9 Hoffmann U, Truong QA, Schoenfeld DA *et al*. Coronary CT angiography versus standard evaluation in acute chest pain. *N Engl J Med* 2012;367:299–308.
- 10 Seymour CW, Liu VX, Iwashyna TJ *et al*. Assessment of clinical criteria for sepsis: for the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). *JAMA* 2016;315:762–74.
- 11 Shepherd J, Blauw GJ, Murphy MB *et al*. Pravastatin in elderly individuals at risk of vascular disease (PROSPER): a randomised controlled trial. *Lancet* 2002;360:1623–30.
- 12 Anderson CS, Robinson T, Lindley RI *et al*. Low-dose versus standard-dose intravenous alteplase in acute ischemic stroke. *N Engl J Med* 2016;374:2313–23.
- 13 Estruch R, Ros E, Salas-Salvado J *et al*. Primary prevention of cardiovascular disease with a Mediterranean diet. *N Engl J Med* 2013;368:1279–90.
- 14 Heyland DK, Garland A, Bagshaw SM *et al*. Recovery after critical illness in patients aged 80 years or older: a multi-center prospective observational cohort study. *Intensive Care Med* 2015;41:1911–20.
- 15 Deano RC, Glassner-Kolmin C, Rubenfire M, Frost A, Visovatti S, McLaughlin VV, Gombert-Maitland M. Referral of patients with pulmonary hypertension diagnoses to tertiary pulmonary hypertension centers: the multicenter RePHerral study. *JAMA Intern Med* 2013;173:887–893.
- 16 Wilson FP, Shashaty M, Testani J *et al*. Automated, electronic alerts for acute kidney injury: a single-blind, parallel-group, randomised controlled trial. *Lancet* 2015;385:1966–74.
- 17 Marson AG, Al-Kharusi AM, Alwaidh M *et al*. The SANAD study of effectiveness of valproate, lamotrigine, or topiramate for generalised and unclassifiable epilepsy: an unblinded randomised controlled trial. *Lancet* 2007;369:1016–26.
- 18 Investigators N-SS, Finfer S, Chittock DR *et al*. Intensive versus conventional glucose control in critically ill patients. *N Engl J Med* 2009;360:1283–97 Deano RC, Glassner-Kolmin C, Rubenfire M, Frost A, Visovatti S, McLaughlin VV, Gombert-Maitland M. Referral of patients with pulmonary hypertension diagnoses to tertiary pulmonary hypertension centers: the multicenter RePHerral study. *JAMA Intern Med* 2013;173:887–93.
- 19 McAloon CJ, Makin SDJ, Warriner DR *et al*. *How Twitter can enrich professional development*. London: BMJ Careers, 2016. http://careers.bmj.com/careers/advice/How_Twitter_can_enrich_professional_development [Accessed 27 July 2017].
- 20 Sandars J, Morrison C. What is the Net Generation? The challenge for future medical education. *Med Teach* 2007;29:85–8.
- 21 Sandars J, Homer M, Pell G, Crocker T. Web 2.0 and social software: the medical student way of e-learning. *Med Teach* 2008;30:308–12.
- 22 Avci K, Celikden SG, Eren S, Aydenizoz D. Assessment of medical students' attitudes on social media use in medicine: a cross-sectional study. *BMC Med Educ* 2015;15:18.
- 23 Bosslet GT, Torke AM, Hickman SE, Terry CL, Helft PR. The patient-doctor relationship and online social networks: results of a national survey. *J Gen Intern Med* 2011;26:1168–74.
- 24 Klee D, Covey C, Zhong L. Social media beliefs and usage among family medicine residents and practicing family physicians. *Fam Med* 2015;47:222–6.
- 25 Topf JM, Sparks MA, Phelan PJ *et al*. The Evolution of the Journal Club: From Osler to Twitter. *Am J Kidney Dis* 2017;69:927–36.
- 26 Hall YN, Himmelfarb J. The CKD classification system in the precision medicine era. *Clin J Am Soc Nephrol* 2017;12:346–8.
- 27 Tangren JS, Powe CE, Ankers E *et al*. Pregnancy outcomes after clinical recovery from AKI. *J Am Soc Nephrol* 2016;28:1566–74.
- 28 Loeb S, Roupert M, Van Oort I *et al*. Novel use of Twitter to disseminate and evaluate adherence to clinical guidelines by the European Association of Urology. *BJU Int* 2017;119:820–2.
- 29 Rivas JG, Socarras MR, Blanco LT. Social media in urology: opportunities, applications, appropriate use and new horizons. *Cent European J Urol* 2016;69:293–8.
- 30 Borgmann H, Woelm JH, Merseburger A *et al*. Qualitative Twitter analysis of participants, tweet strategies, and tweet content at a major urologic conference. *Can Urol Assoc J* 2016;10:39–44.
- 31 Bower C. *Twitter Journal Club: yet another 'revolution' in scientific communication?* BMJ London: BMJ Blogs, 2011. <http://blogs.bmj.com/bmj-journals-development-blog/2011/07/15/twitter-journal-club-yet-another-revolution-in-scientific-communication/> [Accessed 10 July 2017].
- 32 McGowan BS, Wasko M, Vartabedian BS *et al*. Understanding the factors that influence the adoption and meaningful use of social media by physicians to share medical information. *J Med Internet Res* 2012;14:e117.
- 33 Pearson D, Bond MC, Kegg J *et al*. Evaluation of social media use by emergency medicine residents and faculty. *West J Emerg Med* 2015;16:715–20.

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